

INTERNATIONAL
RANGE OFFICERS
ASSOCIATION

CHRONOGRAPH MANUAL

JANUARY 2021 EDITION

International Range Officers Association
Carretera Vieja de Bunyola
Km 6,2 – 07141 Marratxi
Mallorca, Spain

Tel: 1705 726 2651 WhatsApp: 1705 7336989
Email: iroa@ipsc.org Web: www.ipsc.org

IROA Academy: iroa.invisionzone.com

Copyright © 2021 International Range Officers Association

Index

1. Why use a chronograph?	3
2. When should a chronograph be used?	3
3. Pre-match planning	4
4. Ammunition selection and storage at the match	5
5. Build and operation of the chronograph stage	6
5.1 Location and set up	6
5.2 Initial set up and calibration of the chronograph (Rule 5.6.2 & Appendix C1 & C4)	7
5.3 Chronograph Operation during the pre-match and match (Rule 5.6.2 & Appendix C1 & C4)	7
5.3.1 Start of day	7
5.3.2 Testing ammunition at the chronograph stage	8
5.3.3 End of day action	11
5.3.4 End of match action	11
Appendix 1 – Chronograph Match Planning Checklist	12
Appendix 2 – Daily Chronograph Report (Appendix C4, IPSC rules)	14
Appendix 3 – Screen Shot of ESS Chronograph Sheet	15
Appendix 4 – Unsafe or Prohibited Ammunition	16

1. Why use a chronograph?

The International Practical Shooting Confederation (IPSC) constitution defines the nature of practical marksmanship as embodied in the following words, *Diligentia-Vis-Celeritas*, (DVC) or Accuracy, Power and Speed. The chronograph is the way IPSC tests compliance with one of these key elements, Power.

The use of a chronograph and the processes for selecting and testing ammunition are defined in the IPSC rules for:

- Handgun
- Pistol Caliber Carbine
- Rifle
- Shotgun

In these disciplines the chronograph establishes whether a competitor's ammunition meets the minimum power factor, and for some disciplines whether the power factor is major or minor scoring as defined in Appendix D of the IPSC rules.

The use of the chronograph in Action Air is only to test compliance with the maximum power factor of projectiles (Rule 5.6.1). If used, the chronograph must be set up and operated as outlined in this manual. The chronograph is not used for Mini Rifle (Appendix A1).

For all IPSC disciplines except Mini Rifle and Action Air, the use of the chronograph is recommended at level II and III IPSC matches and is mandatory at level IV and V matches (Appendix A1). It is recommended that a chronograph is used at level IV and V Action Air matches.

2. When should a chronograph be used?

Where specified for the discipline, the use of a chronograph is recommended at any IPSC level II or higher match and is mandatory at level IV and level V matches (Appendix A1).

A chronograph should be used at any IPSC level 3 or higher match where IPSC poppers are included in the course of fire to test the ammunition for popper calibration (except Shotgun and Mini Rifle where Appendix C1 applies) and to be available for failed calibration tests and/or testing potentially unsafe ammunition (Shotgun Rule 5.5.6.3 and Handgun Appendix D1 Special Condition 14).

In addition, the following options for the use of the chronograph to test a competitor's ammunition are recommended depending on the specific discipline and the level of the IPSC match:

1. **Random testing** – where competitors are selected at random from the competitor list or by a match official designated to select ammunition. This is the recommended option for IPSC Shotgun (Rule 5.6.1.2).
2. **Targeted testing** – where competitors identified as potential Division and Category winners are selected for testing. Selection could be based on their prior performance or after the first day of a multi-day event.
3. **All competitor and random testing** - where all competitors have their ammunition selected and tested, or have ammunition checked as Official Match Ammunition. In addition,

competitors may also be tested randomly or if a request for calibration fails. The exception is Shotgun where all competitor testing is not advised (Rule 5.6.1.2).

At level IV and V IPSC matches the third option must be adopted for Handgun, Pistol Caliber Carbine and Rifle.

As well as carrying out the primary function of the testing of competitors' ammunition, the chronograph team may also be used to carry out safety checks on competitor firearms and/or checks for compliance with the discipline divisions.

3. Pre-match planning

The decision about how and when a chronograph will be used must be part of pre-match planning. This makes sure the required resources, processes and people are put in place to deliver effective and accurate ammunition selection and testing.

The Match Director and Range Master must agree if a chronograph is required and which option of testing will be applied (see 2 above).

If a chronograph is to be used the following must be agreed:

- **Where the chronograph will be physically located.** This needs to consider the requirement for electrical power, sturdy tables and chairs, cover from the weather, the storage and security of selected ammunition and critically how the testing process fits with the match schedule. At a level IV or level V match it is strongly recommended that the chronograph be co-located with a Short course of fire or be very near so that they can work together.
- **Match Schedule** – include chronograph in the planning.
- **Electrical Supply** – ensure a safe and reliable source of power that does not fluctuate or interfere with the correct function of the chronograph.
- **Chronograph availability for use.** This includes the days and hours it will open and close and whether the match chronograph will be available for use by competitors for unofficial testing of ammunition. Unofficial testing on the match chronograph must not be allowed once the pre-match has commenced and until the main match has been completed. Match organisers may as a courtesy provide a chronograph on a test firing bay (Rule 5.8.2) for use by all competitors.
- **The plan and process for ammunition selection.** This needs to be agreed in advance. Where ammunition is selected in large volumes (for example on the first morning of a multi-day match) the plan needs to consider how and where the bags of ammunition will be transported, sorted and stored until tested and may need to allow time for the bullet/projectiles to be pulled and weighed.
- **Which model and make of chronograph will be selected.** The make and model selected must not rely on natural light and at level IV and V matches there needs to be a minimum of two chronographs as well as replacement sky screens (if the chronograph uses these) in case of damage during testing. It is strongly recommended that a back-up chronograph of the same make and model is available should one of the primary chronographs fail for any reason.
- **What additional equipment will be required.** This includes a suitable stand or wood box to house the chronograph(s), a shooting rest, multiple kinetic bullet pullers and solid wooden block, electronic weighing scales including a wind guard, batteries for the chronograph and the weighing scales, stable tables and chairs, a receptacle for discarded powder, a sharp blade/guillotine for shotgun ammunition, heavy duty storage boxes for ammunition bags, a tablet (if test results are entered electronically) a radio, and a tape measure.
- **The type and quantity of calibration ammunition.** The ammunition needs to be very consistent and meet the power factor required for the discipline (Appendix C1.2). There needs

to be enough to allow the testing of the chronograph and all poppers at the commencement of each match day including the pre-match, as well as for any calibration challenges requested by competitors throughout the match.

- **The quantity and type of plastic bags for ammunition selection.** The bags need to be robust enough to hold eight rounds of ammunition and be re-sealable. They should be labelled with pre-printed labels which include the following information: competitor name and number, declared power factor and declared Division. Bags with blank labels should be available for use by match officials for random testing.
- **Whether the test results will be recorded electronically or on paper.** If not using ESS/electronic scoring to enter the chronograph results, then pre-printed chronograph record sheets will be needed for all competitors along with a few blanks for random tests.
- **The type and number of match officials.** A minimum of two match officials at level IV or V matches is recommended or when all competitors are to be tested. These need to be accurate, highly organized, and able to maintain an efficient flow of competitors. Additional range crew may be required if safety or Division checks are to be carried out.
- **What additional tests may be carried out at the chronograph.** As part of match planning, the Match Director and Range Master may decide to include tests of firearms (for example to ensure compliance with safety or Division) or to identify potentially unsafe ammunition. If so, the match schedule needs to consider these in the time allowed and provide the necessary equipment as detailed in the relevant IROA Equipment Check (Appendix D and E).
- **Information for competitors.** How information will be provided to competitors as part of the match information about match ammunition, ammunition testing and/or the use of a chronograph. It is good practice to inform competitors in advance the make and model of chronograph being used for testing. Match entry forms may also require all competitors to declare their understanding that failure to comply or attend a chronograph test will result in their scores being withdrawn from the match.

4. Ammunition selection and storage at the match

The selection of ammunition for the chronograph must be by a match official (Rule 5.6.3.3). This must include official match ammunition (Rule 5.8) which can be checked and verified at the chronograph (Rule 5.8.1). For Shotgun, ammunition selected must be of the same type i.e. birdshot or buckshot or slug (Rule 5.6.11). If a competitor is using a mixture of official match ammunition and other ammunition then samples of both must be selected for checking and where required, testing. If a competitor has rounds of different bullet/projectile weights in his possession, 8 sample rounds of each must be drawn for testing.

If all competitors are to be tested, it is strongly recommended that ammunition selection and testing through the chronograph should be scheduled with a short course of fire. This allows ammunition to be selected as the competitor leaves the line and the actual test can be completed immediately. It also means that the collection and storage of large volumes of ammunition is not required.

If this is not possible, the ammunition should be selected at a designated stage or at a designated time (like the competitor's first stage). There needs to be clear instructions for when competitors must attend the chronograph for testing, which should be scheduled in advance as part of match squading. Arrangements need to be put in place for the safe and secure storage of the ammunition which must be out of direct sunlight and in a temperature-controlled environment.

If all competitors are not to be tested, the Range Master will establish how random or targeted ammunition selection will be applied.

The ammunition once selected will need to be transported to the chronograph, where the match officials can pull and weigh the bullet/projectiles in preparation for the official test (Rule 5.6.3.4). If the bullet/projectiles are pre-weighed this must be clearly written in grains including any decimal points on the label. Ammunition can also be checked to make sure it is not unsafe (Rule 5.5.6).

Once prepared, the ammunition bags including the pulled bullet/projectiles should be filed by squad, in competitor number order in heavy duty storage containers. These containers can then be securely stored at multi-day events while allowing match officials to easily find and access the ammunition of individual competitors.

5. Build and operation of the chronograph stage

5.1 Location and set up

The chronograph along with all necessary equipment must be treated like a stage and set up at a suitable location at the match, easily accessible to competitors.

The set up should be as follows:

- The chronograph must be on a range or safe location so that when shots are fired, they land in a safe direction. A target downrange will aid consistent shots being fired across the chronograph.
- Set up the chronograph(s) on a suitable stand and/or in a chronograph box in accordance with the manufacturer's user guide/operating instructions (Rule 5.6.2) which must be provided. The chronograph must be protected from the weather and any outside interference be set a minimum distance away (as the manufacturer's user guide/operating instructions) to avoid interference by the muzzle blast.
- Where multiple chronographs are being used to simultaneously test ammunition these must be set up sequentially so that the bullet/projectile(s) when fired pass over both chronographs.
- The chronograph should use a mode which does not require natural light (e.g. infra-red) otherwise a light box must be built and used to ensure consistent lighting. A chronograph which relies on light must not be used with fluorescent lighting.
- Close to a reliable and consistent source of power (mains or battery) for the chronograph.
- Set up a table as a firing point with a suitable rest and chair(s). The inside edge of the table should be set so that the muzzle of the firearm is at the optimum distance as stated by the manufacturer from the front of the first chronograph. The firing point should include a fault line extending to the left and right of the rear of the table.
- The table should be large enough to include the firearm rest, chronograph readout(s), the tablet/paperwork and any equipment required for additional firearm tests (for example minimum trigger pull). The table should be laid out with the chronograph readout clearly visible and the gun rest in the center. A clear space with a mark showing where the gun should be positioned by the competitor when requested (an inverted T for a handgun) should be provided and this should also indicate safe muzzle direction.
- A chair should be provided for the competitor where they can see the chronograph test results as the gun is being fired.
- Behind the firing point create a space for the safe and secure storage of any paperwork and any selected ammunition. This should also have the weighing scales with a wind guard so that the bullet/projectiles can be weighed if required.
- Beyond this, the rear of the chronograph range should be closed to restrict access to match officials, and any competitors when they are called forward for the tests. This should be

designed to include a defined entrance where competitors can be met by a match official and their ammunition bag identified.

- The match may also provide seating and cover for any competitors waiting for their ammunition to be tested.

5.2 Initial set up and calibration of the chronograph (Rule 5.6.2 & Appendix C1 & C4)

At the commencement of the first day of the match (including any pre-match) the chronograph must be set up in accordance with the manufacturer's instructions and tested.

Once assembled and connected to the power, a single round must be fired over the chronograph. This is not an official test but is to ensure that the chronograph is properly assembled and is functioning correctly.

The official test of the chronograph is then conducted as follows (Rule 5.6.2.1):

- A Range Officer will fire 3 rounds from the supply of the official match calibration ammunition through the calibration firearm over the chronograph, and the average velocity of the 3 rounds will be recorded.
- This establishes the average velocity (+/- 5%) which must be met by the calibration gun and the calibration ammunition at the commencement of every subsequent day the chronograph is being used.

The results must be recorded on the Daily Chronograph Report Form (Appendix C4) along with the details of the calibration gun. This report must be displayed prominently on the chronograph stage and a separate record kept of the results by the official responsible for the chronograph.

5.3 Chronograph operation during the pre-match and match (Rule 5.6.2 & Appendix C1 & C4)

5.3.1 Start of day

Each day, the chronograph team must set up and calibrate the chronograph and then test any calibration guns prior to the commencement of the match. This ensures that the chronograph is tested for consistency, and the calibration guns and ammunition are correct before being used to calibrate any IPSC poppers.

On arrival on the range the chronograph team should prepare for the day, assembling the chronograph and weighing scales, and laying out the equipment and ammunition bags by squad in competitor number order.

Once assembled and connected to the power, a single round must be fired over the chronograph. This ensures that the chronograph is properly connected and functioning before the daily test (Rule 5.6.2.2).

The Range Officer then fires 3 rounds from the supply of the official match calibration ammunition through the calibration firearm over the chronograph, and the average velocity of the 3 rounds is recorded. This must be the same firearm used in the test on the first day as recorded on the Daily Chronograph Report Form (Appendix C4).

The chronograph will be deemed to be within tolerance if the daily average velocity is within +/- 5% of the average velocity achieved (Rule 5.6.2.1).

Should a daily variance exceed the allowable tolerance, the Range Master must be informed by the chronograph official, and he will take whatever steps necessary to rectify the situation.

Once the test has been satisfactorily completed the results must be recorded on the Daily Chronograph Report Form (Appendix C4) and a separate record kept of the results by the official responsible for the chronograph.

For Handgun, Pistol Caliber Carbine and Rifle, the chronograph team must daily test any additional calibration firearms which are being used for the match (Appendix C1.2). Once this has been completed, the calibration guns and ammunition can be made available for calibration. It is good practice to keep a note of the test results for the calibration firearms in case this is subsequently challenged.

5.3.2 Testing ammunition at the chronograph stage

Signage should direct competitors to the chronograph and at the entrance to the range must warn all competitors to wear eye and hearing protection, as shooting can commence at any time.

If the chronograph is co-located with a Short course, then the chronograph officials can select the ammunition as the competitor finishes the stage and they can then go straight to the chronograph where the test can be carried out. If a competitor cannot attend the chronograph immediately due to illness or a broken gun, then their ammunition must be selected, and they be given a specific day and time to attend for testing which should be noted on the ammunition bag. Any competitors who have withdrawn from the match or been disqualified must be identified and their record noted.

Where ammunition is collected in bulk, on the arrival of a competitor or a squad for ammunition testing, the range officer needs to identify the squad and locate the competitor's ammunition. The ammunition for any competitors who have withdrawn from the match or been disqualified must be identified and put to one side for return or safe disposal.

The official match weighing scales must be initially calibrated, in accordance with the manufacturer's instructions, when the first squad arrives for testing each day and again immediately before each subsequent squad is tested (Rule 5.6.2.5).

On arrival, individual competitors should be briefed as a squad or an individual on the process and asked to identify their ammunition bag. Equipment Check Sheets if being used will be provided by the match officials from the last stage or the Stats Office if the first scheduled activity of the day. If the gun doesn't match the information written in the Equipment Check Sheet, the Range Master must be informed by the chronograph official about the situation.

If the bullet/projectile has been pulled and weighed the competitor must be told the weight and if challenged the bullet/projectile must be re-weighed in the presence of the competitor after the scales have been calibrated (Rule 5.6.3.4). The competitor must be notified if the weighed bullet is less than the minimum required for major in their Division (Rule Handgun Appendix D1. Open Division 14) or discipline (Pistol Caliber Carbine Appendix D3-14). The ammunition bag and any paperwork can then be provided to the range officer to carry out the chronograph tests.

If the competitor is declaring the use of Official Match Ammunition (Rule 5.8) then the chronograph official must check the official receipt from the match organizers (or their nominated vendor). This needs to show the quantity and description of the subject ammunition purchased at the match. In addition, the chronograph official must visually inspect the ammunition selected to ensure it matches the official ammunition provided by the match.

If the selected ammunition and receipt are in order, the ammunition must be returned to the competitor and no chronograph test is required (Rule 5.6.3) unless random testing is being conducted to provide feedback to the manufacturer or match organizer. The chronograph official must record the use of match ammunition on the tablet (or paper record) and this must be verified by the competitor. If the competitor cannot provide a valid official receipt, or if the ammunition selected is not identical to the match ammunition, then the ammunition must be tested over the chronograph (Rule 5.8.1.1).

When the chronograph is ready the competitor must be called forward to the testing table. Competitors must not handle their handguns, or remove chamber safety flags from long guns, until the range officer gives the range command. Violations are subject to Rule 10.5.1.

On the command 'Make Ready' the competitor must show the cleared firearm to the range officer and place it on the table with the muzzle pointing down range along with their longest empty magazine (if required). A mark on the table showing safe muzzle direction (inverted T for handgun) should be employed to guide the competitor.

The range officer will then carry out the chronograph test and any safety or Division equipment checks (if required). When complete they will ensure the gun is empty and place it back on the table with the muzzle in a safe direction. On the command 'If finished unload and show clear' the competitor will pick up the gun and unload and show clear. For a Handgun on the command 'If clear hammer down holster' they will then safely holster, case or bag the gun. For a longarm on the command 'If clear, hammer down, open action' they will then fit a chamber safety flag and case the gun or point it vertically upwards. When this has been completed the range officer will give the command 'Range is Clear' and the next competitor can approach the test table.

Only the competitor who is having their ammunition tested must be at the firing point and they must be positioned in such a way that they can see the chronograph results as shots are fired and any calculations are made. A chair should be provided for the competitor for this purpose.

The range officer must aim the gun at a target and test the sight picture/alignment and the trigger pull, ready for the chronograph test.

The test of the selected ammunition must then be carried out as follows:

- Ammunition must be tested using the competitor's firearm. From the 8 sample rounds, 1 bullet/projectiles are removed and weighed to determine the actual weight, and 3 are fired over the chronograph. All digits visible on the scales and chronograph displays must be used at face value (i.e. without rounding or truncation), for the power factor calculation. In the absence of a bullet puller and scales, the competitor's declared bullet weight will be used. In the absence of scales, the competitor's declared weight of the projectile(s) will be used.
- Wads are not included in the weight calculation except in the case of wads that are fixed to the back of slugs and that are designed to continue to the target as part of the slug (Rule 5.6.3.3).
- If the match is using two chronographs where the bullet/projectiles pass over both chronographs, then the highest velocity registered on either chronograph must be used in all calculations.
- If bullet/projectile weighing is conducted in advance of a competitor's arrival, weighed bullets/projectiles must be retained with the competitor's remaining sample rounds, until the competitor or their delegate has attended the chronograph station and completed testing. If a competitor challenges the weight of a bullet/projectiles pre-weighed before his arrival, he is entitled to have the scales calibrated, and the test bullet/projectiles reweighed, in his presence.

- The power factor is calculated using the bullet/projectile weight and the average velocity of the 3 rounds fired, according to the following formula:

$$\text{Power Factor} = \frac{\text{bullet weight (grains)} \times \text{average velocity (feet per second)}}{1000}$$

- The result will ignore all decimal places (e.g. a result of 124.9999 is not 125).
- If the resultant power factor fails to meet the declared power factor floor, another 3 rounds will be fired over the chronograph. The power factor will be recalculated using the bullet/projectiles weight and the average velocity of the 3 highest velocity rounds from the 6 rounds fired.
- If the power factor is still insufficient, the competitor may elect to have his final bullet/projectiles:
 - (a) Weighed and, if heavier than the first bullet/projectiles, the power factor calculation will be recalculated using the heavier weight; or
 - (b) Fired over the chronograph and the power factor recalculated using the first bullet/projectiles weight, and the average velocity of the 3 highest velocity rounds from the 7 rounds fired.
- Where the power factor results are +/- 1 (for example 126 or 124) the range officer must manually calculate the results using the average of the three highest recorded velocities and the highest bullet weight to check the result before declaring the test result final.
- If the resultant power factor fails to meet the Major power factor floor of the relevant Division, the competitor's scores will be recalculated as Minor, if achieved.
- If the resultant power factor fails to meet the minimum power factor floor for the relevant Division, the competitor may continue shooting the match, but his scores will not be entered into match results nor count for match recognition and awards.
- If a competitor's ammunition is retested, or if any authorized replacement ammunition is tested, and different power factors are recorded, the lower power factor is applied to score all courses of fire, including those already completed by the competitor.

Once the test has been completed the range officer must record the result which should be verified by the competitor. The lowest power factor achieved during testing will be applied to all his scores in the match. Where the result will mean the competitor is shooting for no score (5.6.3.9) then the Range Master must be informed by the chronograph official and they must confirm this ruling.

If during testing ammunition is found to be unsafe or prohibited, for example the weighed bullet is less than the minimum required for major in their Division (Handgun Rule Appendix D1.Open Division Special Condition 14), fails to meet the minimum bullet weight for the discipline after a second definitive bullet has been weighed (Pistol Caliber Carbine Rule Appendix D3 & D14) or the power factor or velocity exceeds the maximum allowed (Shotgun Rule 5.5.6.3/Pistol Caliber Carbine Rule D2 & D13) then the Range Master must be informed by the chronograph official and the ammunition must be withdrawn from use (see further examples in Appendix 5). Arrangements must be made to select any replacement ammunition for testing.

Should a competitor fail to present his firearm for testing at the designated time and location the Range Master must be informed by the chronograph official. The Range Master or their designate may then wish to arrange for the competitor to be re-scheduled for the ammunition to be tested.

Alternatively, the Range Master may decide that the competitor will be removed from the match results (Rule 5.6.3.11).

5.3.3 End of day action

At the end of each match day the chronograph stage must be officially closed as per the match squading schedule and the Range Master or Area CRO notified by the chronograph official.

The Range Master must be notified by the chronograph official of any competitors who have failed to attend for their ammunition to be tested as scheduled. The Range Master will where possible arrange for the competitors to be contacted and instructed to attend.

The chronograph and auxiliary equipment, along with any selected ammunition must be stored in a secure, dry and temperature-controlled environment ready for the next day.

If the table used for the firing point is moved, then the position must be clearly marked so that it can be replaced in the same position.

The match official responsible must notify the Range Master if the stock of calibration ammunition needs to be replenished.

5.3.4 End of match action

The fully completed Daily Chronograph Report Form (Appendix C4) or an electronic copy must be provided to the Range Master to include with their match report.

Any selected ammunition that has not been tested must be checked to see if any competitors have withdrawn from the match or been disqualified. This ammunition must be identified and put to one side for return or safe disposal.

If the competitor fails to present their firearm for testing before the match ends, then the Range Master must be notified by the chronograph official. The tablet (or paper record) must be updated, and the competitor will be removed from the match results (Rule 5.6.3.11).

Appendix 1 – Chronograph Match Planning Checklist

The following is for use by the Match Director with the Range Master if it is agreed a chronograph will be used at the match (mandatory for all Level IV/V IPSC events except Mini Rifle and Action Air). For detailed instructions consult the latest IROA Chronograph Manual.

Decisions/Tasks	Tick
1. Type and scale of competitor testing (decision required)	
Random testing	
Targeted testing	
All competitor and random testing	
2. Match scheduling (decision required)	
Chronograph scheduled with a Short Course (recommended)	
Chronograph scheduled as a separate stage	
3. Ammunition Collection (decision required)	
At aligned Short Course (all competitor testing)	
On designated stage(s) (all competitor testing) – agree ammunition storage	
Random Testing (agree when/where) – agree ammunition storage	
Targeted Testing (agree when/where) – agree ammunition storage	
4. Chronograph Location (decision required)	
Convenient for competitors	
Cover from inclement weather and reliable power source available	
Space for all equipment, range crew and competitors	
5. Allocation of Range Crew (decision required)	
Chief Range Officer	
Range Officer(s)	
6. Division and Safety Checks (decision required)	
Required (need to provide relevant equipment for checks and consider if additional range crew are needed)	
Not Required	


6. Chronograph Equipment and Supplies	Tick
Chronograph (same manufacturer and model) including manufacturer's user guide/operating instructions (x 2 if a level IV or V match)	
Spare Chronograph (in case of breakage if a level IV or V match)	
Chronograph Stand and Light Box (if required)	
Power Supply – UPC, Automatic Voltage Regulation, or Batteries (if required)	
Shooting Rest	
Sturdy table and 2 x chair(s) for shooting and the competitor Additional chairs for the range crew as required.	
Table for Equipment/Ammunition	
Overhead cover (for chronographs, weighing scales and range crew)	
Weighing Scales and Wind Guard/Box	
Bullet Pullers x 2 and wooden block	
Sharp Blade/Guillotine (Shotgun only)	
Spare Batteries (chronograph and scales) and electrical extension cable (if required)	
Calibration Gun and Ammunition	
Plastic Bags and Printed Labels (ammunition collection)	
Ammunition Storage Containers/Coolers	
Scoring Tablet or Paper Record Sheets (for each competitor)	
Tape Measure (for set up)	
Crowd Control Tape/Barriers	
Chronograph Signage - Production and Allocation	
Equipment for Division/Safety Checks (if required)	

Appendix 2 – Daily Chronograph Report (Appendix C4, IPSC rules)

CHRONOGRAPH DAILY REPORT

Test Gun Make/Model:		Test Gun Serial Number:			Bullet Weight:			
DATE	SHOT VELOCITY (FPS)			Average Velocity	Power Factor	% Change	Initials	
	1	2	3				CRO	RM
						N/A		

Appendix 3 – Screen Shot of ESS Chronograph Sheet

 STAGE 1

[← Squad 3](#) In the hole: #6 Fonseca, Fabio Camara On Deck: #12 Chang, Jack [>](#)

19 Daniel Casagran

Division: Open Factor: Minor Squad: 3

▲ Bullet Weight		▲ Declared Power Factor	
Bullet Weight	<input type="text"/>	Declared Power Factor	<input type="text"/>
▲ Average First 3		▲ Average Best 3 of 6	
V 1	<input type="text"/>	V 4	<input type="text"/>
V 2	<input type="text"/>	V 5	<input type="text"/>
V 3	<input type="text"/>	V 6	<input type="text"/>
Average 1st 3	<input type="text"/>	Average Best 3 of 6	<input type="text"/>
▲ 7th Shot		▲ 7th Bullet Weight	
V 7	<input type="text"/>	Bullet Weight 2	<input type="text"/>
Average Best 3 of 7	<input type="text"/>		
▲ Final Power Factor			
Final Power Factor	<input type="text"/>		

Absent

Review

Appendix 4 – Unsafe or Prohibited Ammunition

The IPSC rules require that unsafe or prohibited ammunition be withdrawn from use. The following are some examples of prohibited and unsafe ammunition that may be identified at the chronograph.

Prohibited ammunition types

Metal piercing, incendiary and/or tracer ammunition is prohibited at IPSC matches. For Pistol Caliber Carbine and Rifle only "Penetrator" ammunition (e.g. with a penetrating core) can only be used if specifically permitted by the match organizers (Rule 5.5.4).

Squib loads

Ammunition which has little, or no powder may be declared unsafe. This often leads to a bullet lodged in the barrel or dropping just beyond the muzzle (Glossary).

Multi-projectile ammunition

This is prohibited for all disciplines except Shotgun (Rule 5.5.5).

Shotgun ammunition

- Slugs that protrude beyond the external limits of the cartridge casing are deemed unsafe (Rule 5.5.6.1).
- Cartridges using specialized long-range wads are prohibited (Rule 5.5.6.2).
- Cartridges exceeding a power factor of 750 are prohibited. The cartridge power factor is calculated either by reference to the manufacturer's published data or determined by the use of a chronograph (Rules 5.5.6 and 5.5.6.3)
- Cartridges with steel or tungsten-based shot or slugs are deemed unsafe for shooting at metal targets (Rule 5.5.6.4).

Handgun ammunition

For Open Division ammunition which fails to meet the minimum bullet weight of 120 grains but which chronographs at Major power factor, will be treated as unsafe and must be withdrawn (Rule 5.5.6 and Appendix D1 Special Condition 14).

Pistol Caliber Carbine ammunition

Ammunition which exceeds the maximum bullet velocity (500 meters (1640 feet) per second will be treated as unsafe and must be withdrawn (see Rule 5.5.6 and Appendix D. Special Condition 2 &13). Ammunition where the second projectile tested weighs less than 115 grains will be treated as unsafe and must be withdrawn (see Rule 5.5.6 and Appendix D3 & D14)

Action Air projectiles

Are prohibited if made of any other material than polymer or biodegradable materials such as starch or bioplastic (Rule. 5.5.4).